

Wabash River Coal Gasification Repowering Project

**Annual Report
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EXECUTIVE SUMMARY

The Wabash River Coal Gasification Repowering Project (WRCGRP, or Wabash Project) is a joint venture of Destec Energy, Inc. of Houston, Texas and PSI Energy, Inc. of Plainfield, Indiana, who will jointly repower an existing 1950 vintage coal fired steam generating plant with coal gasification combined cycle technology. The Project is located in West Terre Haute, Indiana at PSI's existing Wabash River Generating Station. The Project will process locally mined Indiana high sulfur coal to produce 262 megawatts of electricity.

PSI and Destec are participating in the Department of Energy Clean Coal Technology Program to demonstrate coal gasification repowering of an existing generating unit affected by the Clean Air Act Amendments. As a Clean Coal Round IV selection, the project will demonstrate integration of an existing PSI steam turbine generator and auxiliaries, a new combustion turbine generator, heat recovery steam generator tandem, and a coal gasification facility to achieve improved efficiency, reduced emissions, and reduced installation costs.

Upon completion in 1995, the Project will not only represent the largest coal gasification combined cycle power plant in the United States, but will also emit lower emissions than other high sulfur coal fired power plants and will result in a heat rate improvement of approximately 20% over the existing plant configuration.

The Wabash Project achieved several significant milestones in 1995, including:

- Completion of the Project Evaluation Report, Continuation Application for Budget Period 3 and 90% Construction Completion Formal Project Review;
- Completion of Budget Period 2;
- Completion of Phase II construction activities;
- Completion of hydrotest of HRSG;
- Gas Turbine Generator operation on oil and syngas;
- Initial firing with Coal;
- Delivery of syngas;
- Successful thermal integration of the combined operations;
- Completion of the demonstration test and commencement of Phase III activities.

As of the end of December 1995, Phase II work is 100% complete for the gasification plant and for the power generation plant. The gasification plant completed the demonstration tests to achieve commercial status on November 18, 1995.

Major milestones and activities projected for 1996 involve completion of the Startup and Modification Report, update of the Project Management Plan, demonstrate extended operation of the Gasification facility at design rates and continued demonstration of the commercial viability of the project.

Due to construction and start-up delays, Budget Period 3 began November 1995.

INTRODUCTION

In September 1991 the United States Department of Energy (DOE) selected the Wabash River Coal Gasification Repowering Project (WRCGRP) for funding under the Round IV of the DOE's Clean Coal Technology Program. This was followed by nine months of negotiations and a congressional review period. The DOE executed a Cooperative Agreement on July 28, 1992. The project's sponsors, PSI Energy, Inc., and Destec Energy, Inc., will demonstrate, in a fully commercial setting, coal gasification repowering of an existing generating unit affected by the Clean Air Act Amendments (CAAA). The project will also demonstrate important advances in Destec's coal gasification process for high sulfur bituminous coal. After receiving the necessary state, local and federal approvals, this project began construction in the third quarter of 1993 and commercial operations in the third quarter of 1995. This facility has a three-year planned demonstration period and 22 year operating period (25 years total).

The Wabash River Coal Gasification Repowering Project, a joint venture of Destec and PSI Energy, has developed, designed, constructed, owns and now operates a coal gasification combined cycle (CGCC) power plant. Coal gasification technology, originally developed by The Dow Chemical Company and owned by Destec, was used to repower Unit 1 of PSI's Wabash River Generating Station in West Terre Haute, Indiana. The CGCC power plant will produce a nominal 262 net megawatts (MWe) of clean, energy efficient capacity for PSI's customers. In the repowered configuration, PSI and its customers can additionally benefit because this project can enhance PSI's compliance plan under the CAAA regulations. The project is designed to use locally mined high sulfur coal and represents the largest CGCC power plant in operation in the United States. This plant is also designed to emit significantly lower emissions than most other high sulfur, coal fired power plants.

BACKGROUND INFORMATION

Project Inception and Objectives

Public Law 101-121 provided \$600 million to conduct cost-shared Clean Coal Technology (CCT) projects to demonstrate technologies that are capable of replacing, retrofitting, or repowering existing facilities. To that end, a Program Opportunity Notice (PON) was issued by the Department of Energy in January 1991, soliciting proposals to demonstrate innovative energy efficient technologies that were capable of being commercialized in the 1990's. These technologies were to be capable of: (1) achieving significant reductions in the emissions of sulfur dioxide and/or nitrogen oxides from existing facilities to minimize environmental impacts such as transboundary and interstate pollution and/or; (2) providing for future energy needs in an environmentally acceptable manner.

In response to the PON, 33 proposals were received by the DOE in May 1991. After evaluation, nine projects were selected for award. These projects involved both advanced and pollution control technologies that can be "retrofitted" to existing facilities and "repowering" technologies that not only reduce air pollution but also increase generating plant capacity and extend the operating life of the facility.

One of the nine projects selected for funding is the project proposed by the Wabash River Coal Gasification Repowering Project Joint Venture. This proposal (a Joint Venture between Destec Energy, Inc. of Houston, Texas and PSI Energy, Inc. of Plainfield, Indiana) requested financial assistance from DOE for the design, construction, and operation of a nominal 2500 ton-per-day (262 MWe) two-stage, oxygen-blown, coal gasification combined cycle (CGCC) repowering demonstration project. The project, named the Wabash River Coal Gasification Repowering Project, is to be located at PSI's Wabash River Generating Station in West Terre Haute, Indiana. The project location and site are shown in Figures 1, 2, 3, and 4. The demonstration project will utilize advanced coal gasification technology in a commercial repowering setting to repower an existing generating unit affected by the Clean Air Act Amendments of 1990. Sulfur emissions from the repowered generating unit will be reduced by greater than 90%, while at the same time increasing electrical generating capacity over 150%. The project, including the demonstration phase, will last 79 months at a total revised proposed cost of \$438 million. The DOE's share of the project cost will be 50% or \$219 million.

The CGCC system will consist of: (See Figures 5 & 5A)

- Destec's oxygen-blown, entrained flow, two stage coal gasifier, which is capable of utilizing high sulfur bituminous coal;
- An air separation unit;
- A gas conditioning system for removing sulfur compounds and particulate;
- Systems or mechanical devices for improved coal feed and all necessary coal handling equipment;
- A combined cycle power generation system wherein the gasified coal syngas is combusted in a combustion turbine generator;
- A heat recovery steam generator.

The result of repowering will be a CGCC power plant with low environmental emissions (SO_2 of less than 0.25 lbs/MMbtu and NO_x of less than 0.1 lb/MMbtu) and high net plant efficiency. The repowering will increase unit output, providing a total CGCC capacity of nominal 262 MWe. The Project will demonstrate important technological advancements in processing high sulfur bituminous coal.

In addition to the joint venture members, PSI and Destec, the Phase II project team includes Sargent & Lundy, who are providing engineering services to PSI; and Dow Engineering, who are providing engineering services to Destec.

The potential market for repowering with the demonstrated technology is large and includes many existing utility boilers currently fueled by coal, oil, or natural gas. In addition to greater, more cost effective reduction of SO_2 and NO_x emissions attainable by using the gasification technology, net plant heat rate will be improved. This improvement is a direct result of the combined cycle feature of the technology which integrates a combustion topping cycle with a steam bottoming cycle. This technology is suitable for repowering applications and can be applied to any existing steam cycle located at plants with enough land area to accommodate coal handling and storage.

One of the project objectives is to advance the commercialization of coal gasification technology. The electric utility industry has traditionally been reluctant to accept coal gasification technology and other new technologies as demonstrated in the U.S. and abroad because the industry has no mechanism for differentiating risk/return aspects of new technologies. Utility investments in new technologies may be disallowed from rate-base inclusion if the technologies do not meet performance expectations. Additionally, the rates of return on these are regulated at the same level as established lower risk technologies. Therefore, minimal incentives exist for the utility to invest in, or develop, new technologies. Accordingly, most of the risk in new technologies has traditionally been assumed by the supplier.

The factors described above are constraints to the development of, and demand for, clean coal technologies. Constraints to development of new technologies also exist on the supply side. Developers of new technologies typically self-finance or obtain financing for projects through lenders or other equity investors. Lenders will generally not assume performance and operational risks associated with new technology. The majority of funds available from lending agencies for energy producing projects are for technologies with demonstrated histories in reliability, maintenance costs and environmental performance. Equity investors who invest in new energy technologies also seek higher returns to accept risk and often require the developer of the new technology to take performance and operational risks.

Consequently, the overall scenario results in minimum incentives for commercial size developments of new technologies. Yet without the commercial size test facilities, the majority of the risk issues remain unresolved. Addressing these risk issues through utility scale demonstration projects is one of the primary objectives of DOE's Clean Coal Technology Program.

The Wabash River Coal Gasification Repowering Project was developed in order to demonstrate the Destec Coal Gasification Technology in an environment, and at such a scale, as to prove the commercial viability of the technology. Those parties affected by the success of this Project include the coal industry, electric utilities, ratepayers, and regulators. Also, the financial community, who will provide the funds for commercialization, is keenly interested in the success of this project. Without a demonstration satisfying all of these interests, the technology will make little advancement. Factors of relevance to further commercialization are:

- The Project scale (262 MWe) is compatible with all commercially available advanced gas turbines and thus completely resolves the issue of scale-up risks.
- The operational term of the Project is expected to be approximately 25 years including the DOE demonstration period of the first 3 years. This will alleviate any concerns that the demonstration does not define a fully commercial plant from a cost and operational viewpoint.
- The Project will dispatch on a utility system and be called upon to operate in a manner similar to other utility generating units.
- The Project will operate under a services agreement that defines guarantees of environmental performance, capacity, availability, coal to gas conversion efficiency and maximum auxiliary power consumption. This agreement will serve as a model for future commercialization of the Destec Coal Gasification Technology and define the fully commercial nature of the Project.

- The Project will be designed to accommodate most coals available in Indiana and typical of those available to midwestern utilities, thereby enabling utilities to judge fuel flexibility. The Project will also enable testing of varying coal types on support of future commercialization of the Destec Coal Gasification Technology.

Plant Description

The Wabash River Coal Gasification Repowering Project will develop, design, construct, own, and operate a coal gasification combined cycle (CGCC) power plant. Coal Gasification technology owned by Destec, will be used to repower one of six units at PSI's Wabash River Generating Station in West Terre Haute, Indiana. The Project will be in operation for a minimum of 25 years. In the repowered configuration, PSI and its customers will additionally benefit because of the role the Project will play in PSI's Clean Air Act compliance plan. The CGCC power plant will produce 262 MWe of clean, energy efficient, cost effective capacity for PSI's customers. An additional economic benefit of the State of Indiana is that the project will not only represent the largest CGCC power plant in operation, but will also emit lower emission than other large, high sulfur coal fired power plants.

The gasification process can be described in the following manner: (see Figures 6 and 7): Coal is ground with water to form a slurry and then pumped into a gasification vessel where oxygen is added to form a hot, raw gas through partial combustion. Most of the non-carbon material in the coal melts and flows out the bottom of the vessel forming slag (a black, glassy, non-leaching, sand like material). The hot, raw gas is then cooled in a heat exchanger to generate high pressure steam. Particulates, sulfur, and other impurities are removed from the gas to make acceptable fuel for the gas turbine. The gasification process byproducts, sulfur and slag, will be sold thus mitigating the waste disposal problems of competing technologies.

The synthetic fuel gas (syngas) is piped to a combustion turbine generator which produces approximately 192 MWe of electricity. A heat recovery steam generator recovers gas turbine exhaust heat to produce high pressure steam. This steam and the steam generator in the gasification process supply an existing steam turbine generator in PSI's plant to produce an additional 104 MWe. The net plant heat rate for the entire new and repowered unit is approximately 9,000 Btu/kWh (Higher Heating Value or HHV), representing an improvement of approximately 20% over the existing unit. The project heat rate will be among the lowest of commercially operated coal fired facilities in the United States.

The Destec Coal Gasification process was originally developed by The Dow Chemical Company during the 1970's in order to diversify its fuel base. The technology being used at Wabash is an extension of the experience gained from pilot plants and the full scale commercial facility, Louisiana Gasification Technology, Inc., (LGTI) which operated from April 1987 until November 1995.

In order to generate data necessary for commercialization, the Joint Venture has chosen a very ambitious approach for incorporation of novel technology in the project. This approach is supported by PSI's desire to have another proven technology alternative available for future repowering or new base load units. Destec desires to enhance its competitive position relative to other clean coal technologies by demonstrating new techniques and process enhancements as well as gain information about operating cost and performance expectations. The incorporation of novel technology in the project will enable utilities to make informed commercial decisions concerning the utilization of Destec's technology, especially in a repowering application.

New enhancements, techniques and other improvements included in the novel technology envelope for the project are as follows:

- **A novel application** of integrated coal gasification combined cycle technology will be demonstrated at the project for the first time – **repowering of an existing coal fired power generating unit.**
- The **coal fuel** for the project will be **high sulfur bituminous coal**, thus demonstrating the environmental performance and energy efficiency of Destec's advanced two-stage coal gasification process. Previous Destec technology development has focused on lower rank, more reactive coals.
- **Hot/Dry particulate removal/recycle will be demonstrated at full commercial scale** by the project. Destec's plant, LGTI, utilized a wet scrubber system to remove particulates from the raw syngas.

Other coal gasification process enhancements included in the project to improve the efficiency and environmental characteristics of the system are as follows:

- **Syngas Recycle** will provide fuel and process flexibility while maintaining high efficiency.
- **A High Pressure Boiler** will cool the hot, raw gas by producing steam at a pressure of 1,600 pounds per square inch absolute (psia). Destec's first unit is currently operating at a pressure of 650 psia in a much less corrosive environment than will be experienced at the project.

- **The Carbonyl Sulfide (COS) Hydrolysis** system to be incorporated at the project will be Destec's first application of this technology. This system is necessary to attain the high percent removal of sulfur at the project.
- **The Slag Fines Recycle** system will recover most of the carbon present in the slag byproducts stream and recycle it back for enhanced carbon conversion. This also results in a high quality slag by-product.
- **Fuel Gas Moisturization** will be accomplished at the project by the use of low level heat in a concept different from that used by Destec before. This concept will reduce the steam injection required for nitrous oxide (NO_x) control in the combustion turbine.
- Sour water, produced by condensation as the syngas is cooled, will be processed differently from the method used at LGTI. This novel **Sour Water System**, to be used at the project, will allow more complete recycling of this stream, reducing waste water and increasing efficiency.
- An oxygen plant producing **95 percent pure oxygen** will be used by the project. This will increase the overall efficiency of the project by lowering the power required for production of oxygen.
- The **power generation facilities** included in the project will incorporate the latest advancements in combined cycle system design while accommodating design constraints necessary to repower the existing Unit 1 steam turbine.
- The project will incorporate an **Advanced Gas Turbine** with a new design compressor and higher pressure ratios.
- **Integration Between the Heat Recovery Steam Generator (HRSG) and the Gasification Facility** has been optimized at the project to yield higher efficiency and lower operating costs.
- **Repowering of the Existing Steam Turbine** will involve upgrading the unit in order to accept increased steam flows generated by the HRSG. In this manner, the cycle efficiency will be maximized because more of the available energy in the cycle will be utilized.

The gasification/repowering approach offers the following advantages as compared to other options:

- This is a viable alternative that will add life to existing older units. The primary assumption, however, is that reasonable life exists in the steam turbine to be repowered. If reasonable life exists in the steam turbine, the approach eliminates the need for refurbishment of much of the high wear components of conventional pulverized coal units. Three such items are the boiler, coal pulverizers and high energy piping systems.
- This approach is an alternative for Clean Air Act compliance compared with the traditional scrubber approach. Although space constraints are similar for the installed facility, waste storage requirements are smaller due to salable by-products in lieu of onsite storage of scrubber sludge.
- This approach provides a use for high sulfur coal. This is particularly important in areas such as Indiana where high sulfur coal is abundant and provides a substantial employment base.

Project Management

The WRCGRP Joint Venture has established a Project Office for the execution of the project. The Project Office is located at Destec's corporate offices in Houston, Texas. All management, reporting, and projects reviews for the project are carried out as required by the Cooperative Agreement. The Joint Venture partners, through a Joint Venture Agreement, are responsible for the performance of all engineering, design, construction, operation, financial, legal, public affairs, and other administrative and management functions required to execute the project. A Joint Venture Manager has been designated as responsible for the management of the project. A Joint Venture organization chart is shown as Figure 8. The Joint Venture Manager is the official point of interface between the Joint Venture and the DOE for the execution of the Cost Sharing Cooperative Agreement. The Joint Venture Manager is responsible for assuring that the Project is conducted in accordance with the cost, schedule, and technical baseline established in the Project Management Plan (PMP) and subsequent updates.

Major Activities and Milestones

The Project Cooperative Agreement was signed on July 28, 1992, with an effective date of August 1, 1992. Under the terms of the Cooperative Agreement, Project activities are divided into three phases:

- Phase I Engineering and Procurement
- Phase II Construction and Startup
- Phase III Demonstration

In addition, for purposes of the Cooperative Agreement, the Project is divided into three sequential Budget Periods. The expected duration of each budget period is as follows:

- Budget Period 1 10 months
- Budget Period 2 27 months
- Budget Period 3 39 months

The Project Milestone Schedule is provided in Figure 9.

Phase I Activities – Engineering and Procurement

Under the provisions of the Cooperative Agreement, the work activity in Phase I (engineering and procurement) focused on detailed engineering of both the syngas and power plant elements of the project which included design drawings, construction specifications and bid packages, solicitation documents for major hardware and the procurement. Site work was undertaken during this time period to meet the overall construction schedule requirements. The Project Team includes all necessary management, administrative and technical support.

The activities completed during this period were those necessary to provide the design basis for construction of the plant, including capital cost estimates sufficient for financing, and all necessary permits for construction and subsequent operation of the facility.

The work during Phase I can be broken down into the following main areas:

- Project Definition Activities
- Plant Design
- Permitting and Environmental Activities

Each of these activities is briefly described below. All Phase I activities were complete by 1993.

Project Definition Activities

This work included the conceptual engineering to establish the project size, installation configuration, operating rates and parameters. Definition of required support services, all necessary permits, fuel supply, and waste disposal arrangements were also developed as part of the Project Definitions Activities. From this information the cost parameters and projects economics were established (including capital costs, project development costs and operation and maintenance costs). Additionally, all project agreements necessary for construction of the plant were concluded. These include the cooperative agreement and the gasification services agreement.

Plant Design

This activity includes preparation of design and major equipment specifications along with plant piping and instrumentation diagrams (P&ID's), process control releases, process descriptions, and performance criteria. These were prepared in order to obtain firm equipment specifications for major plant components which established the basis for detailed engineering and design.

Permitting and Environmental Activities

During Phase I, applications were made and received for the permits and environmental activities necessary for the construction and subsequent operation of the project. The major project permits include:

- Indiana Utility Regulatory Commission – The state authority reviewed the project (under a petition from PSI for a Certificate of Necessity) to ensure the project will be beneficial to the state and PSI ratepayers. The technical and commercial terms of the project were reviewed in this process.
- Air Permit – This permit details the allowable emission levels for air pollutants from the project. It was issued under standards established by the Indiana Department of Environmental Management (IDEM) and the Environmental Protection Agency (EPA) Region V. This permit also included within it the authority to commence construction.
- NPDES Permit – This permit details and controls the quality of waste water discharge from the project. It was reviewed and issued by the Indiana Department of Environmental Management. For this project it will be a modification of the existing permit for PSI's Wabash River Generating Station.
- NEPA Review – The National Environmental Policy Act review was carried out by the DOE based on project information provided by the participants. The scope of this review is comprehensive in addressing all environmental issues associated with potential project impacts on air, water, terrestrial, quality, health and safety, and socioeconomic impacts.

Miscellaneous permits and approvals necessary for construction and subsequent operation of the project included the following.

- FAA Stack Height/Location Approval
Controlling Authority: Federal Aviation Administration
- Industrial Waste Generator
Controlling Authority: Indiana Department of Environmental Management
- Solid Waste
- FCC Radio License
- Spill Prevention Plan
- Wastewater Pollution Control Device Permit
Controlling Authority: IDEM

Phase II Activities – Construction

Construction activities occurred in Phase II and included the necessary construction planning and integration with the engineering and procurement effort. Planning the construction of the project began early in Phase I. Separate on-site construction staff for both Destec and PSI were provided to focus on their respective work for each element of the Project. Construction personnel coordinated the site geotechnical surveys, equipment delivery, storage and lay down space requirements. The construction activities included scheduling, equipment delivery, erection, contractors, security and control.

The detail design phase of the project includes engineering, drawings, equipment lists, plant layouts, detail equipment specifications, construction specification, bid packages and all activities necessary for construction, installation, and startup of the project.

Performance and progress during this period was monitored in accordance with previously established baseline plans.

Phase III Activities – Demonstration Period

Phase III consists of a three year demonstration period and an additional 22 year project operation period. The operation effort for the project began with the development of the operating plan including integration with the early engineering and design work of the project. Plant operation input to engineering was vital to assure optimum considerations for plant operations and maintenance and to assure high reliability of the facilities. The operating effort continues with the selection and training of the operating staffs, development of the plant operations manuals, the coordination of the startup with the construction crew, planning and execution of plant commissioning, the conduct and documentation of the plant acceptance test and continued operation and maintenance of the facility throughout the demonstration period.

Phase III activities are intended to establish the operational aspects of the project in order to prove the design, operability and longevity of the plant in a fully commercial utility environment.

Budget Periods

For ease of administration, the Project is divided into three subsequent budget periods with expected durations of:

- Budget Period 1 9 months
- Budget Period 2 26 months
- Budget Period 3 39 months

Budget Period 1 activities include pre-DOE award and project definition tasks, preliminary engineering work, and permitting activities. Budget Period 2 activities include detailed engineering, procurement, construction, pre-operations training tasks, and startup. Budget Period 3 activities include the three-year demonstration period. The budget period costs were originally projected and revised as follows:

	Original	Revised
Budget Period 1 DOE Share	\$43,175,801	\$21,864,590
Budget Period 2 DOE Share	\$102,523,632	\$144,934,843
Budget Period 3 DOE Share	\$52,300,567	\$52,300,567
Total	\$198,000,000	\$219,100,000

ACTIVITIES DURING 1995

A current Project schedule, indicating milestone dates and current status, is provided as Figure 10.

Phase I Activities – Engineering and Procurement

Phase I activities commenced with signing of the Project Cooperative Agreement in July 1992 and were completed in 1994.

Phase II Activities – Construction

Construction activities were initiated in 1993 and at a schedule-recovery level of intensity were completed in November 1995. At the beginning of 1995, the construction, commissioning and startup of the project were scheduled for completion by August 15. The delay was due to the combined effects of permitting delays of six months, a construction delay of over three months, unusually inclement weather during the first six months of construction and replacement of a prime mechanical subcontractor of the Gasification facility in late 1994. By the end of 1995 all subcontractors had been demobilized.

In preparation for start-up, pre-operations management activities included: operations and maintenance staffing and training, implementation of walkdown, commissioning, turnover, acceptance and punchout of plant subsystems, and the development of plans and procedures. All items were completed prior to start-up.

Significant in the start-up phase was the successful demonstration of the thermal integration of the combined operations. Although feedwater control problems, which have since been resolved, contributed to early operation interruptions, there were no substantial problems integrating the steam and water systems.

Phase III Activities – Demonstration Period

The plant completed the demonstration test to achieve commercial status on November 18, 1995. The plant was in an outage from November 18 through the end of the month.

In December, the Gasification plant operated for a total of 84 hours on coal. PSI operated the combustion turbine on syngas feed for 49 hours in the month. See Figure 11 for plant operations statistics.

The main problem area identified during the December campaign was associated with the primary dry char filtration system. Due to char breakthrough, as well as high system differential pressures, the gasification plant had to be taken off line to investigate and repair the cause. Production of power was limited due to gasification operations, failure of a pressure safety valve to reseal on the HRSG economizer, and the failure of a gas turbine Nox injection steam valve.

Budget Period 2 Activities

Budget Period 2 began on May 29, 1993 and concluded August 31, 1995. Construction, pre-operations personnel and training, plant startup/shakedown and turnover to operations are among the Budget Period 2 activities performed in 1995. Spending for Budget Period 2 was as follows:

	Revised Baseline Budget (per Cont. App. for Budget Period 3)	Actual Shareable Spending as of 12/31/95
Participant Share	\$144,934,842	\$198,124,837
DOE Share	\$144,934,842	\$144,934,843
Total	\$289,869,684	\$343,059,680

As shown above, Budget Period 2 costs were approximately \$50MM higher than anticipated. The increase in construction costs for the gasification facilities are primarily due to the following: a change in mechanical subcontractor; severe cold and wet weather during the first six months of construction; design delays and changes in the field; and labor shortages. The construction costs increases associated with the Power Plant were also impacted by poor weather and construction labor shortages, as well as costs incurred during the extended start-up period.

DOE Reporting and Deliverables

Spending and budget reports were submitted on both a monthly and quarterly basis according to the requirements of the Cooperative Agreement. Project reviews and Joint Venture quarterly reports were provided to the DOE. The 90% construction review meeting was held in March 1995. The construction status for both facilities was presented and turnover, commissioning, and startup plans were reviewed.

The following reporting requirements were submitted in accordance with Attachment C, sections 6 and 7 of the Cooperative Agreement.

- Continuation Application for Budget Period 3
- Final Public Design Report
- Test Plan
- Environmental Monitoring Reports

Other Activities

Several public relations and education activities were carried out in 1995. Appendix C provides a list of selected public information and trade and technical papers presented by Destec or PSI personnel related to the WRCGRP.

In November 1995, Project Dedication ceremonies were held in Terre Haute, Indiana and were attended by the DOE, PSI, Destec and numerous media representatives. The keynote speaker at the event was Hazel O'Leary, U.S. Secretary of Energy. Included in the ceremonies was the dedication of the William T. Langan Gasification Control and Administrative building in memory of his energy and vision in making the Wabash River Project a reality. The event received notice in local, state and regional print, radio and television media.

1996 ACTIVITIES AND MILESTONES

Activities in 1996 will focus primarily on completion of the acceptance testing of the Gasification Facility. Major activities for 1996 will include the following:

- Successfully complete acceptance and environmental testing.
- Achieve an increasingly effective understanding of the systems and subsystem operating characteristics.
- Maintain/improve the expected dispatch orders in the Cinergy system.
- Fulfill the provisions of the Environmental Monitoring Plan.
- Obtain the data base and experience-base necessary to advance and meet the commercial markets for the technology.

Other Activities

Other activities of significance include meeting the DOE review and reporting requirements and further development of effective operations and maintenance programs. During 1996 community relations and education programs will be continued.

Appendix A

Glossary of Acronyms

CAAA	-	Clean Air Act Admendments
CCT	-	Clean Coal Technology
CGCC	-	Coal Gasification Combined Cycle
COS	-	Carbonyl Sulfide
DOE	-	Department of Energy
EPA	-	Environmental Protection Agency
HHV	-	Higher Heating Value
HRSG	-	Heat Recovery Steam Generator
IDEM	-	Indiana Department of Environmental Management
LGTI	-	Louisiana Gasification Technology, Inc.
NEPA	-	National Environmental Policy Act
NPDES	-	National Pollutant Discharge Elimination System
P&ID	-	Piping and Instrument Drawings
PMP	-	Project Management Plan
PON	-	Program Opportunity Notice
WRCGRP	-	Wabash River Coal Gasification Repowering Project

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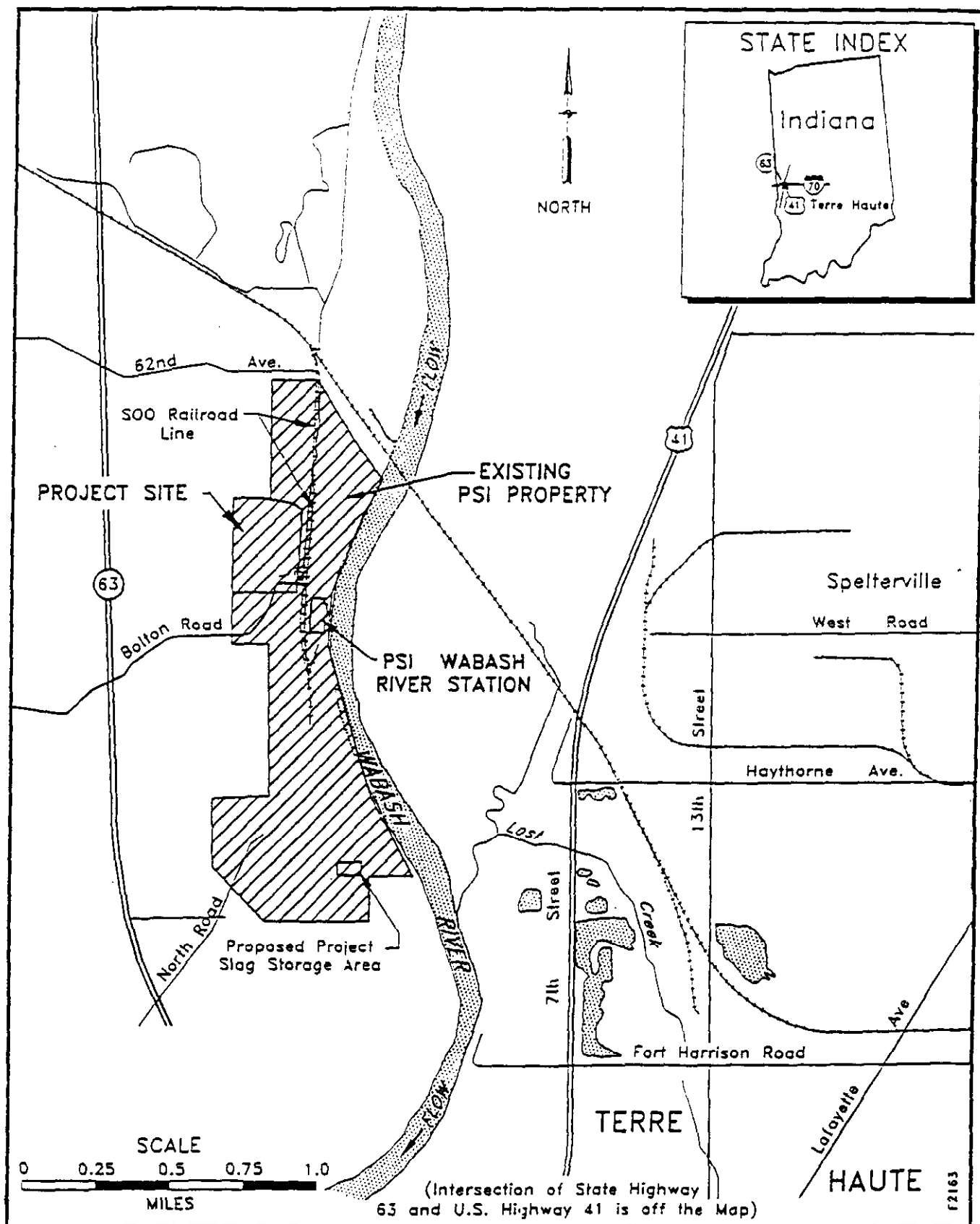


Figure 1 General Location Map Showing the Site of the Project

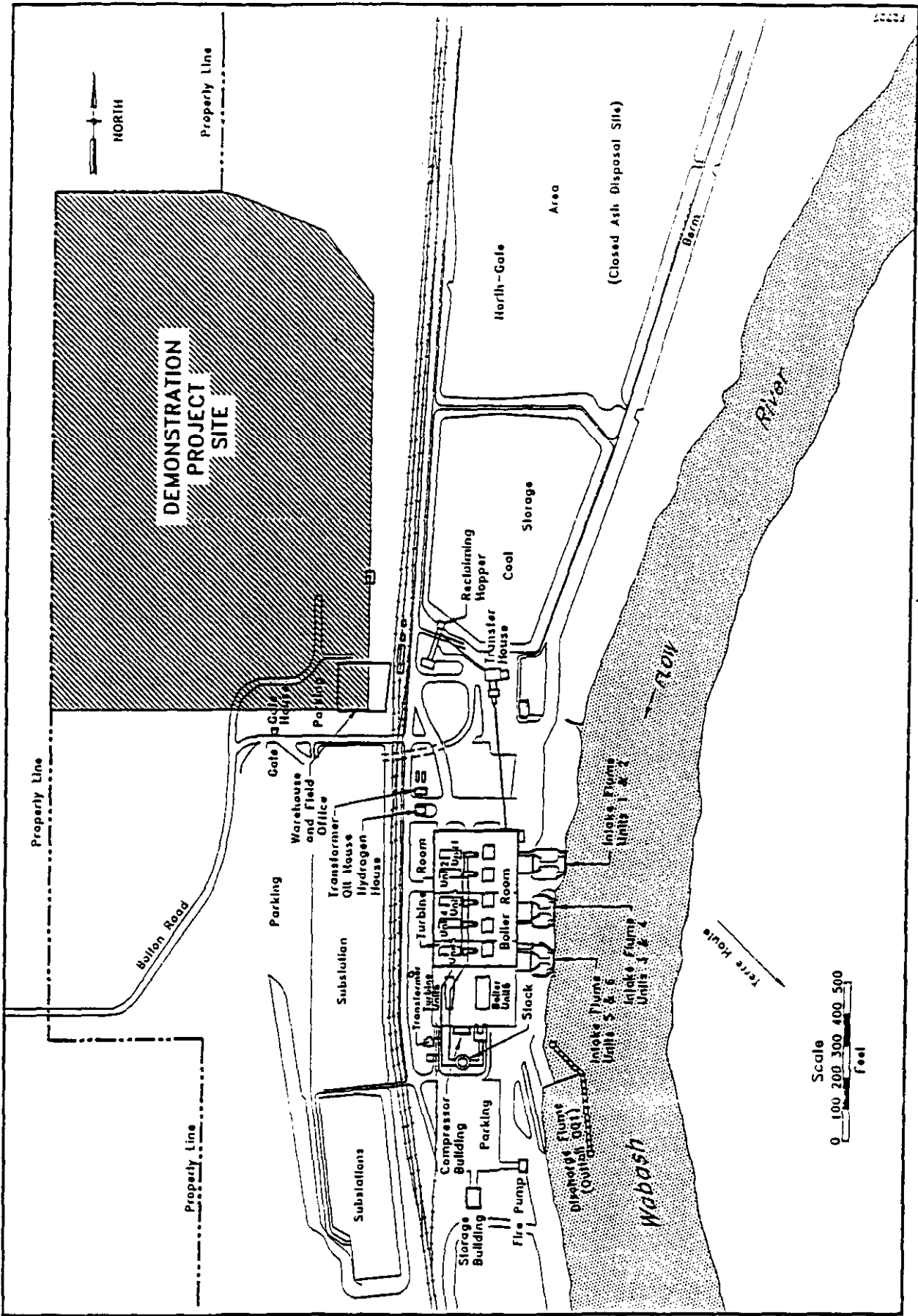


Figure 2 Site Map of the Wabash River Generating Station

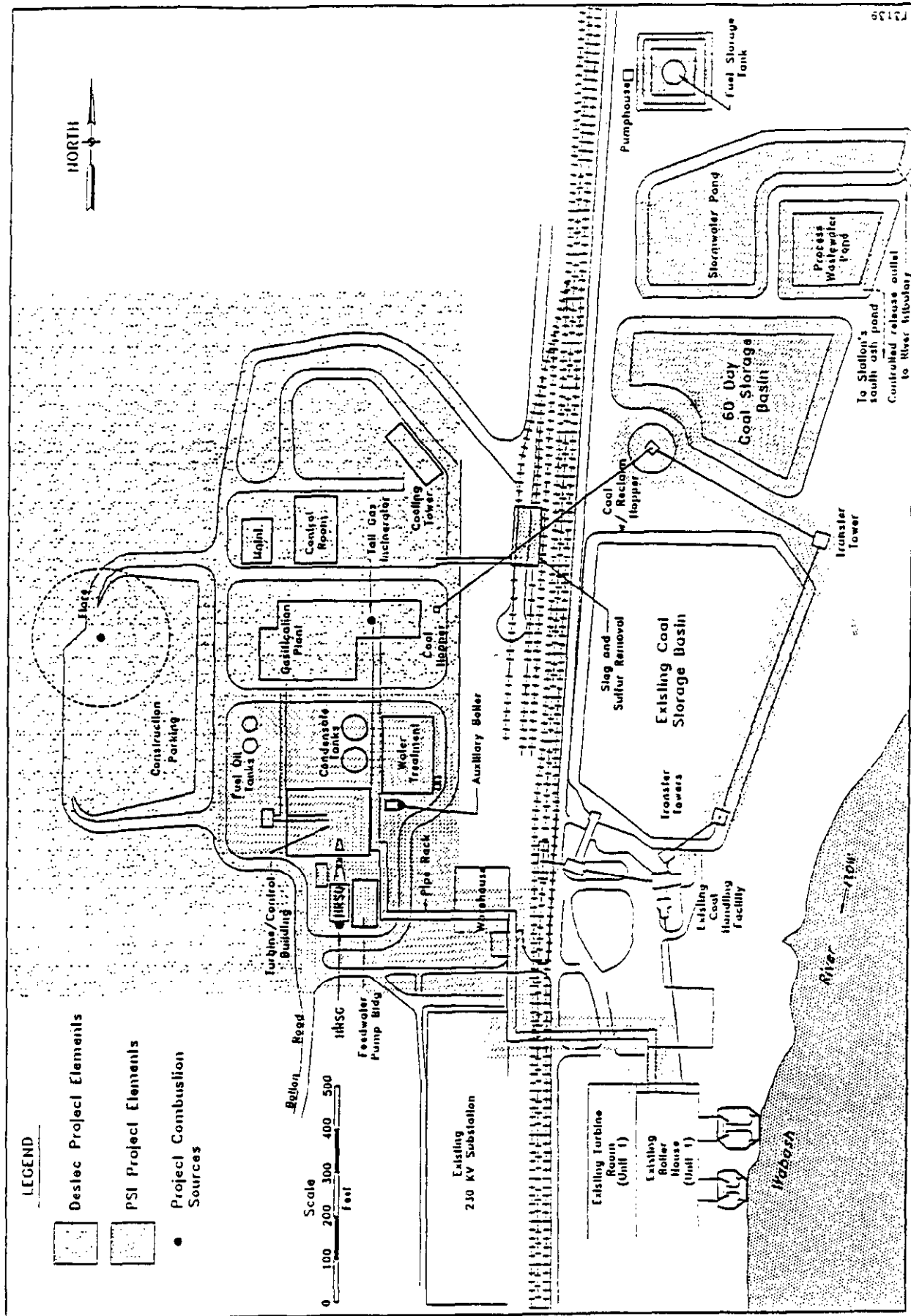


Figure 3 Project Plot Plan

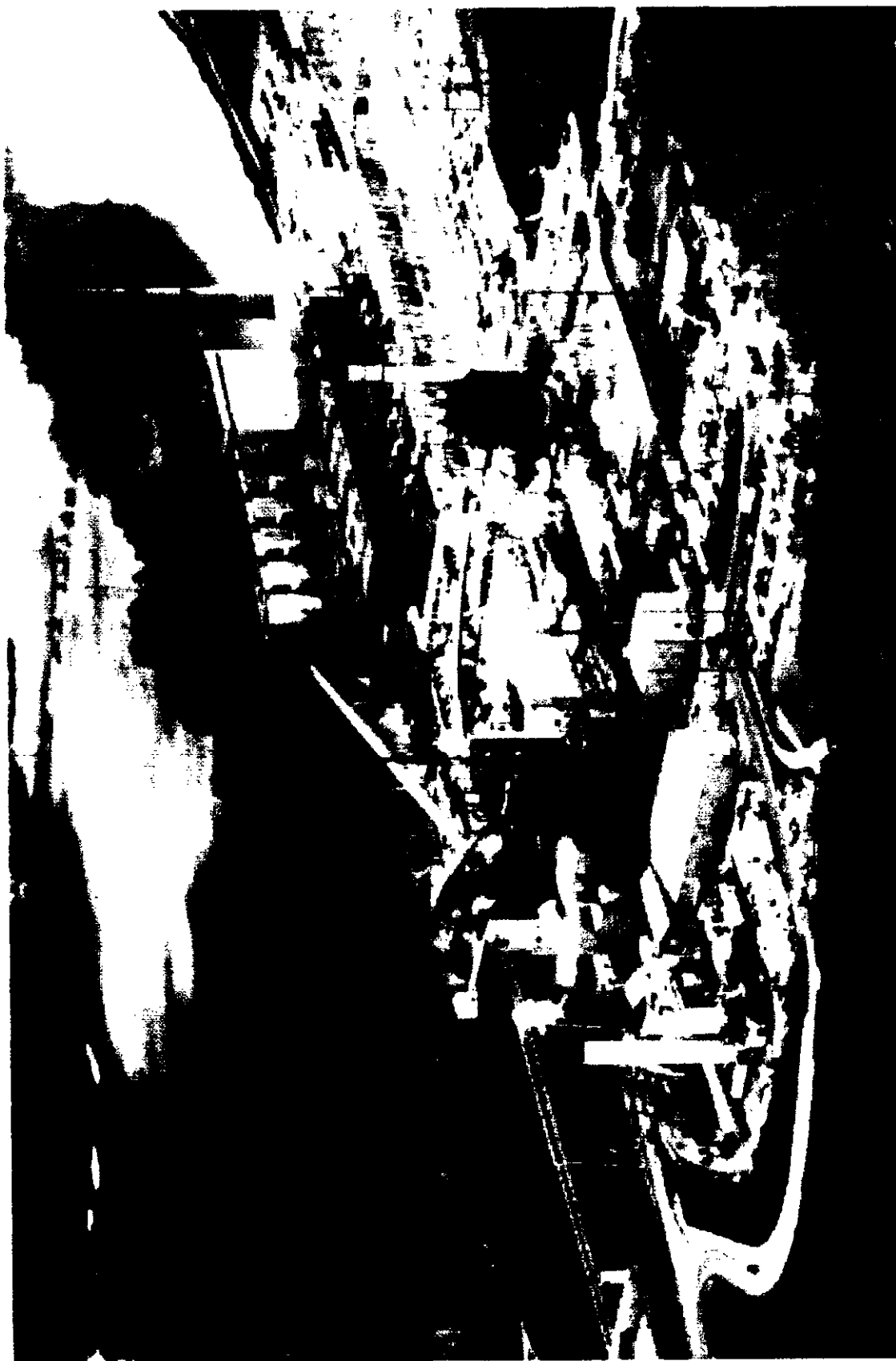


Figure 4

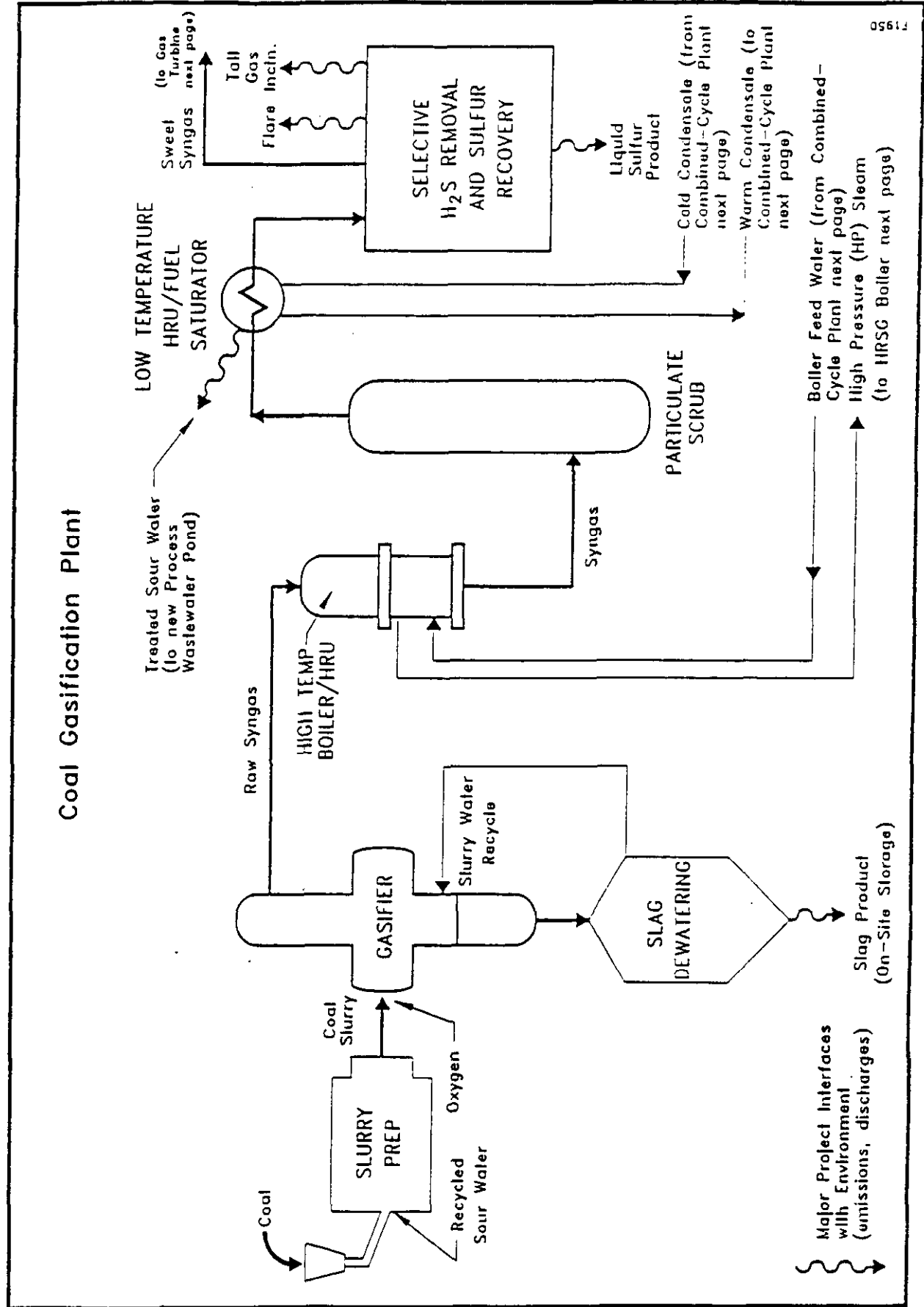


Figure 5 Conceptual CGC Process Schematic

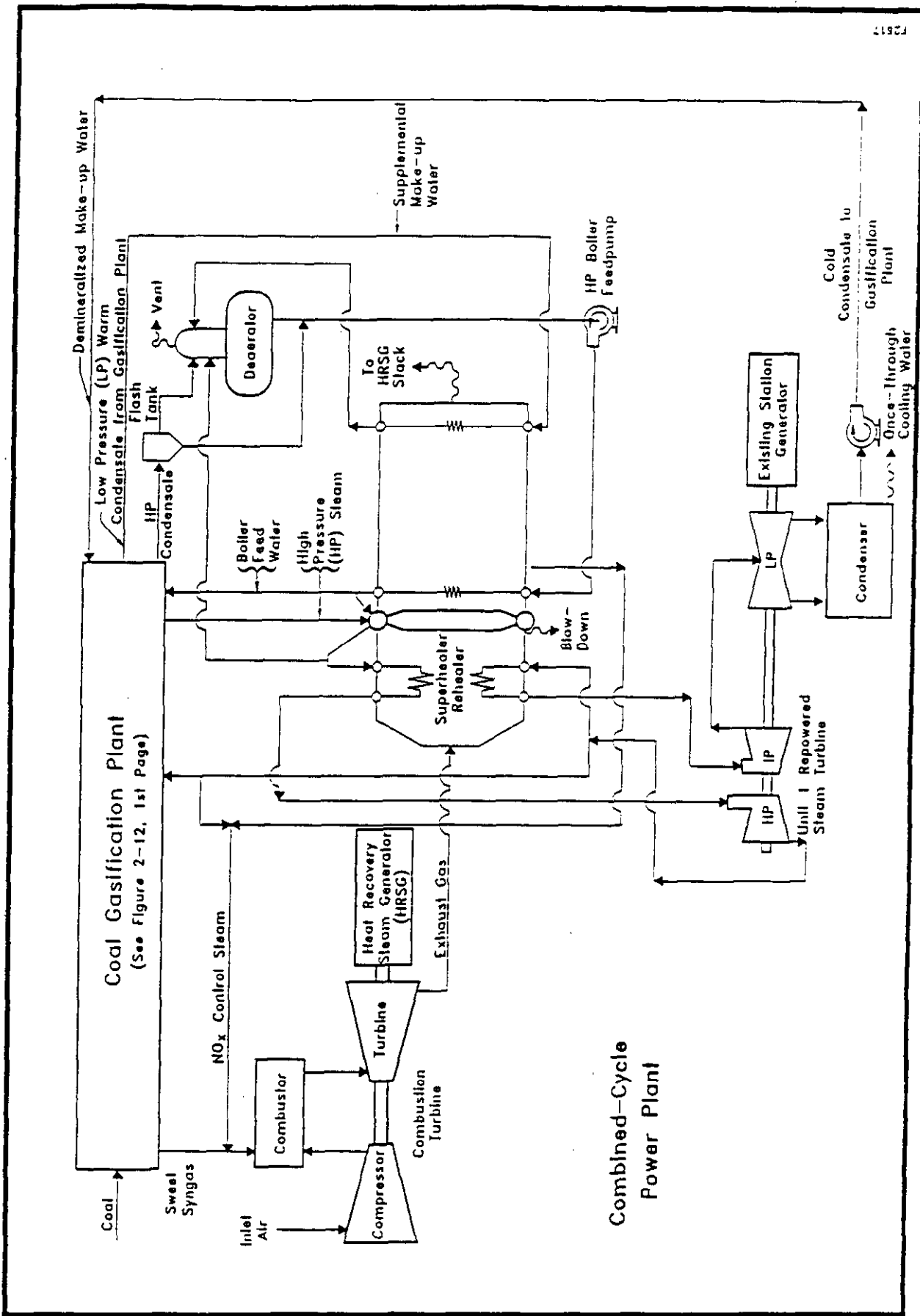


Figure 5A (Continued)

Block Flow Diagram

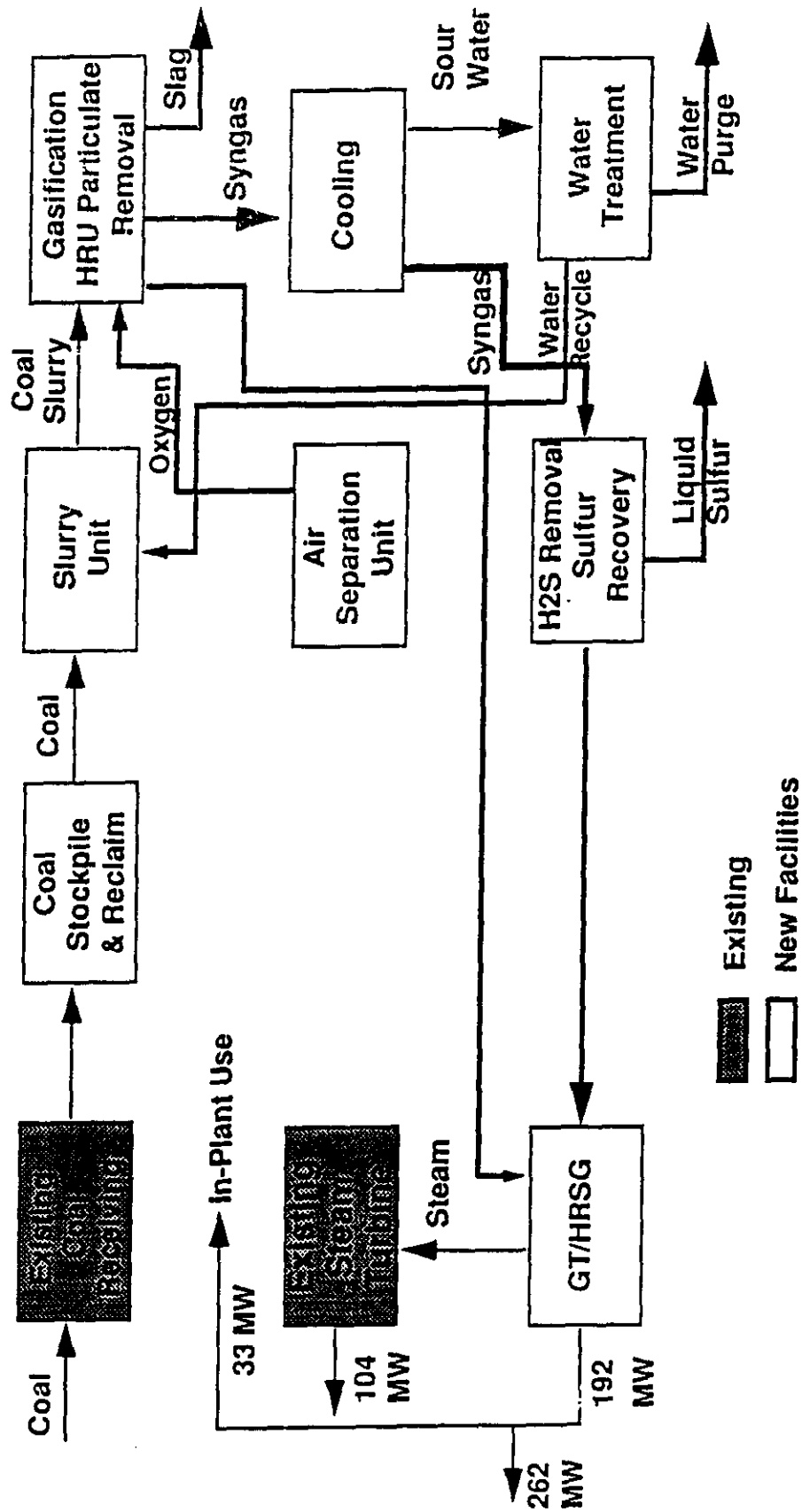


Figure 6

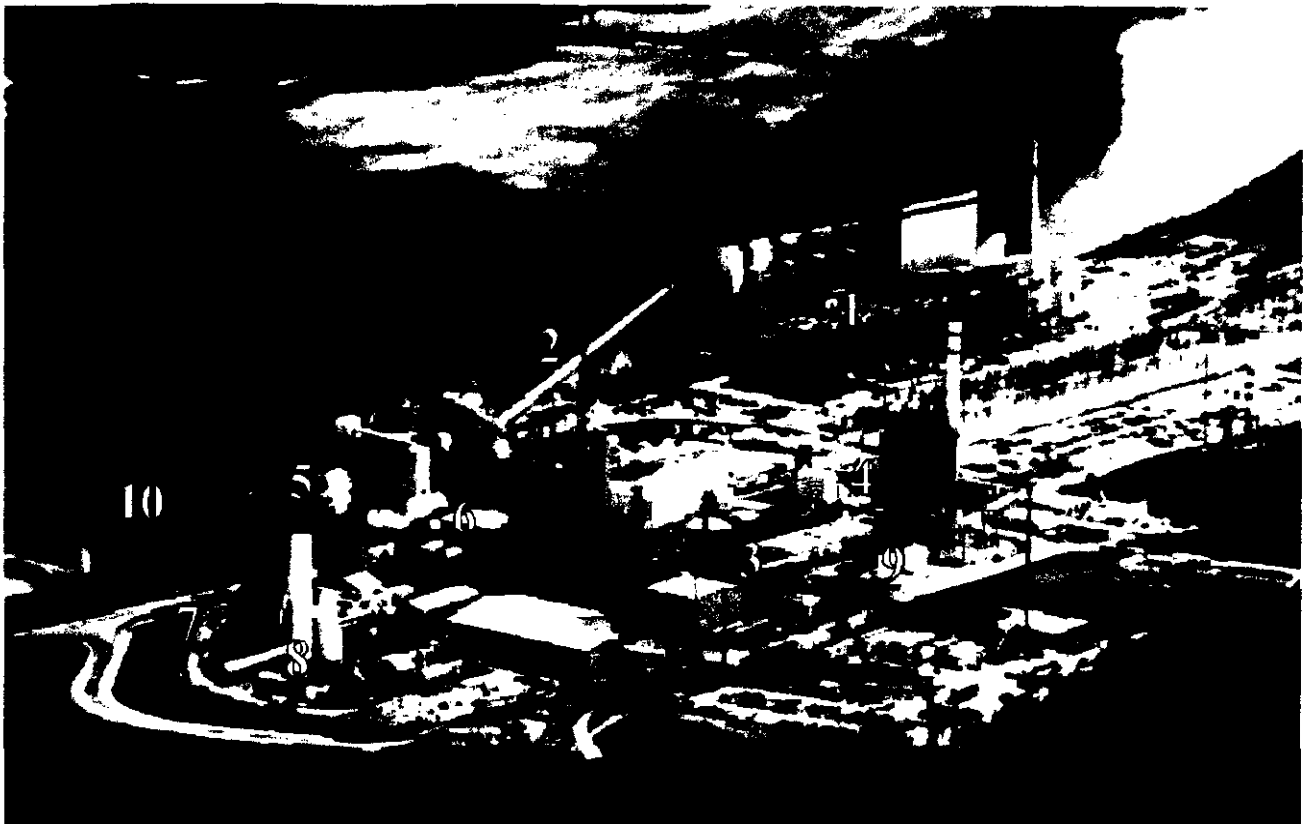


Figure 7

- 1. Existing Wabash Station**
- 2. Existing coal transfer tower**
- 3. Gas turbine building**
- 4. Heat recovery steam generator**
- 5. Coal receiving silo**
- 6. Gasifier**
- 7. Cooling Tower**
- 8. Oxygen plant**
- 9. New substation**
- 10. Existing coal pile**

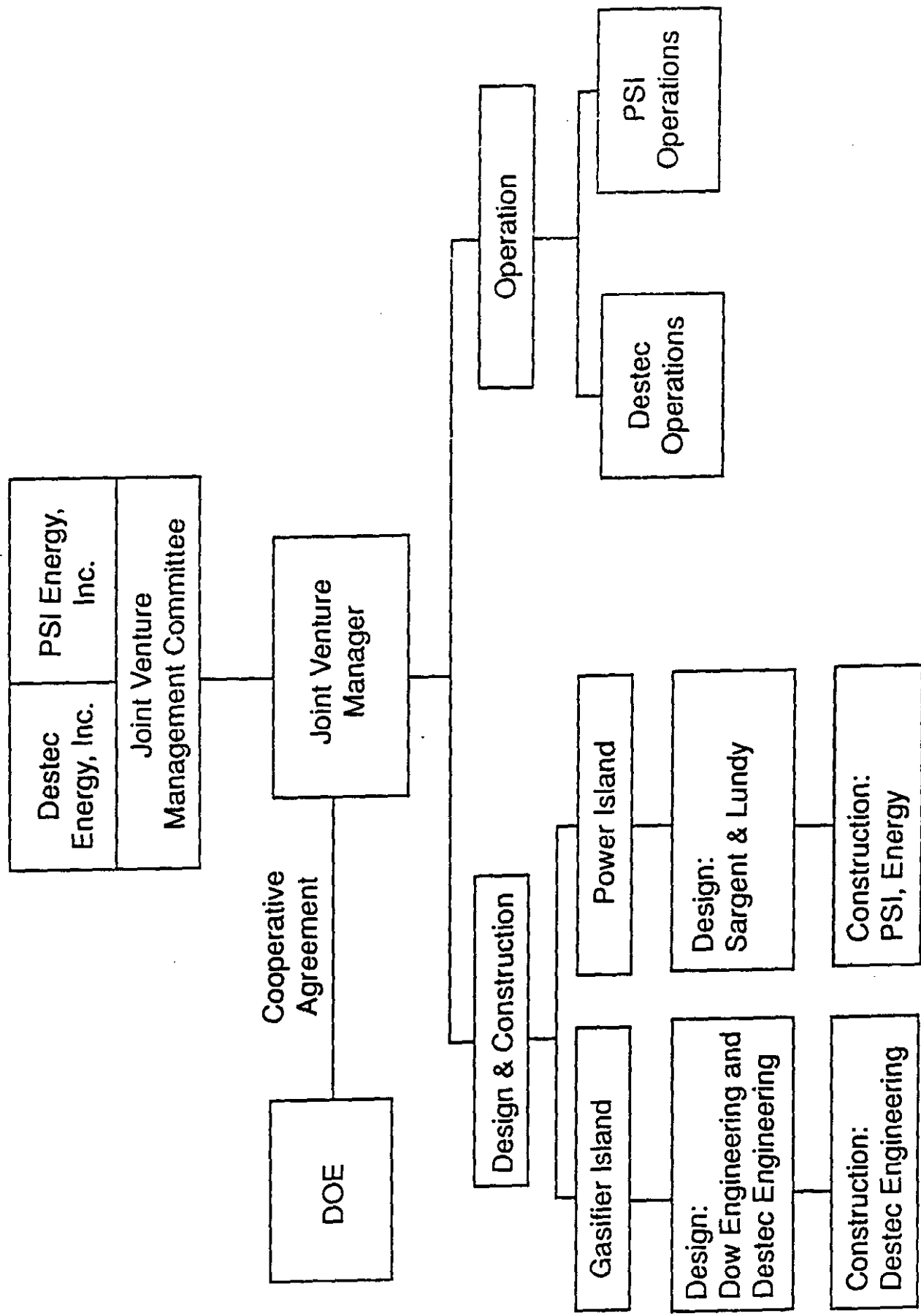


Figure 8 Project Organization

WABASH RIVER COAL GASIFICATION REPOWERING PROJECT

LIST OF PROJECT MILESTONES

WBS	MILESTONE	May 1998				June 2, 1995		May 1996		Completion Date
		Nov. 1992 Proj. Mgmt. Plan Original Baseline	Nov. 1993 Proj. Eval. Plan Revised Baseline	June 2, 1995 Contin. Appl'n Revised Baseline	May 1996 Proj. Mgmt. Plan Current Baseline					
1.1.04	Signing of Gasification Services Agreement	06/24/92	06/24/92	06/24/92	06/24/92					06/24/92
1.1.05	Completion of Funding	03/15/92	11/19/92	11/19/92	11/19/92					11/19/92
1.1.06	Receipt of Air Permits Receipt of NPDES Permit Modifications	03/01/93 12/01/92	05/28/93 12/01/92	05/27/93 12/06/93	05/27/93 12/06/93					05/27/93 12/06/93
1.1.07	NEPA Completion	10/01/92	05/28/93	05/28/93	05/28/93					05/28/93
1.1.08	Receipt of IURC Certificate of Need	03/01/93	05/26/93	05/26/93	05/26/93					05/26/93
1.1.10	Project Management Project Management Plan Financing Plan & Licensing Agreements Project Definition & Preliminary Plant Design Continuation Application Formal Project Review Draft Environmental Monitoring Plan	10/31/92 02/28/93 02/28/93 02/28/93 03/15/93 04/30/93	12/04/92 04/30/93 03/15/93 05/05/93 03/30/93 03/31/93	12/04/92 04/30/93 03/15/93 05/28/93 03/30/93 03/31/93	12/04/92 04/30/93 03/15/93 05/28/93 03/30/93 03/31/93					12/04/92 04/30/93 03/15/93 05/28/93 03/30/93 03/31/93
1.1.13	DOE Award	07/27/92	07/27/92	07/27/92	07/27/92					07/27/92
1.1.30	Award of EPC Subcontract for Oxygen Plant	11/15/92	12/15/92	12/15/92	12/15/92					12/15/92
1.2.01	Project Management Environmental Monitoring Plan 40% Completion Formal Project Review 90% Completion Formal Project Review Final Public Design Report Test Plan Plant Startup Plan Continuation Application	06/30/93 06/30/94 04/30/95 07/31/95 05/25/95 07/31/95 07/31/95	06/30/93 06/30/94 04/30/95 01/31/95 05/25/95 07/31/95 01/31/95	07/28/93 04/05/94 03/09/95 07/01/95 07/01/95 05/25/95 06/02/95	07/28/93 04/05/94 03/09/95 07/01/95 07/01/95 05/25/95 06/02/95					07/28/93 04/05/94 03/09/95 07/01/95 07/01/95 05/25/95 06/02/95
1.2.04	Start of On-Site Dirtwork Release of Gasification Plant Site	12/01/92 09/01/93	06/01/93 09/10/93	06/01/93 09/17/93	06/01/93 09/17/93					06/01/93 09/17/93
1.2.05	Mobilization to Site	09/01/93	09/10/93	09/17/93	09/17/93					09/17/93

Figure 9

WABASH RIVER COAL GASIFICATION REPOWERING PROJECT

LIST OF PROJECT MILESTONES

May 1998										
WBS	MILESTONE	Nov. 1992		Nov. 1993		June 2, 1995		May 1996		Completion Date
		Proj. Mgmt. Plan Original Baseline	Proj. Eval. Plan Revised Baseline	Proj. Eval. Plan Revised Baseline	Contin. Appl'n Revised Baseline	Proj Mgmt Plan Current Baseline				
1.2.20	Award of High Temperature Heat Recovery Unit Award of Gasifier Vessels Jobsite Receipt of HTHRU Jobsite Receipt of Gasifier	11/01/92 01/10/93 09/01/94 07/01/94	11/03/92 01/21/93 09/01/94 07/01/94	11/03/92 01/21/93 09/01/94 07/01/94	11/03/92 01/21/93 07/15/94 05/15/94	11/03/92 01/21/93 07/15/94 05/15/94				11/03/92 01/21/93 07/15/94 05/15/94
1.2.22	Start of Foundation Work Setting of First Gasifier Setting of Second Gasifier Start of Refractory Installation Initial Firing with Coal Initial Delivery of Syngas	09/15/93 09/01/94 11/01/94 09/15/94 08/15/95 08/15/95	10/08/93 09/01/94 11/01/94 09/15/94 07/01/95 07/01/95	10/08/93 06/08/94 06/14/94 08/10/94 07/01/95 07/01/95	10/08/93 06/08/94 06/14/94 08/10/94 07/01/95 07/01/95	10/08/93 06/08/94 06/14/94 08/10/94 07/01/95 07/01/95				10/08/93 06/08/94 06/14/94 08/10/94 08/17/95 08/25/95
1.2.29	Completion of 100 Hour Test	10/01/95	08/15/95	08/15/95	11/18/95	11/18/95				11/18/95
1.2.30	Jobsite Receipt of Main Air Compressor Setting of Column Delivery of Oxygen	09/01/94 08/01/94 07/15/95	09/01/94 08/01/94 07/01/95	07/15/94 03/30/94 06/19/95	07/15/94 03/30/94 06/19/95	07/15/94 03/30/94 06/19/95				07/15/94 03/30/94 06/14/95
1.2.43	Construction Power/Water Available	09/01/93	10/06/93	10/20/93	10/20/93	10/20/93				10/20/93
1.2.50	Award of Coal Handling Subcontract Delivery of Coal to Syngas Facility	04/01/93 07/15/94	09/03/93 01/15/95	09/03/93 05/18/95	09/03/93 05/18/95	09/03/93 05/18/95				09/03/93 05/18/95
1.2.60	Award of STG Modification Subcontract	01/01/93	01/01/93	06/04/93	06/04/93	06/04/93				06/04/93
1.2.70	Award of Gas Turbine Generator (GTG) Award of Heat Recovery Steam Generator (HRSG) Jobsite Delivery of GTG	01/31/92 10/15/92 03/01/94	01/31/92 10/15/92 01/01/94	01/31/92 10/15/92 03/18/94	01/31/92 10/15/92 03/18/94	01/31/92 10/15/92 03/18/94				01/31/92 10/15/92 03/18/94
1.2.75	Hydrotest of HRSG Synchronization of GTG	04/15/95 05/15/95	04/15/95 01/15/95	03/31/95 06/07/95	03/31/95 06/07/95	03/31/95 06/07/95				03/31/95 06/10/95
1.2.81	GTG Operation on Oil GTG Operation on Syngas	01/01/95 05/15/95	01/01/95 08/15/95	06/07/95 08/15/95	06/07/95 10/03/95	06/07/95 10/03/95				06/09/95 10/03/95

Figure 9

WABASH RIVER COAL GASIFICATION REPOWERING PROJECT

LIST OF PROJECT MILESTONES

WBS	MILESTONE	May 1998				Completion Date
		Nov. 1992 Proj. Mgmt. Plan Original Baseline	Nov. 1993 Proj. Eval. Plan Revised Baseline	June 2, 1995 Contin. Appl'n Revised Baseline	May 1996 Proj. Mgmt. Plan Current Baseline	
1.3.01	Project Management					05/16/96
	Startup and Modification Report	12/01/95	12/01/95	11/01/95	10/15/97	
	Project Management Plan Update		not represented	11/01/95	05/01/96	
	Formal Project Reviews	Annual				
	Draft Final Technical Report	07/31/98	07/31/98	09/30/98	01/01/99	
	Technology Performance & Economic Evaluation	11/30/98	11/30/98	10/01/98	02/01/99	
	Final Technical Report	12/31/98	12/31/98	11/30/98	02/28/99	

Figure 9

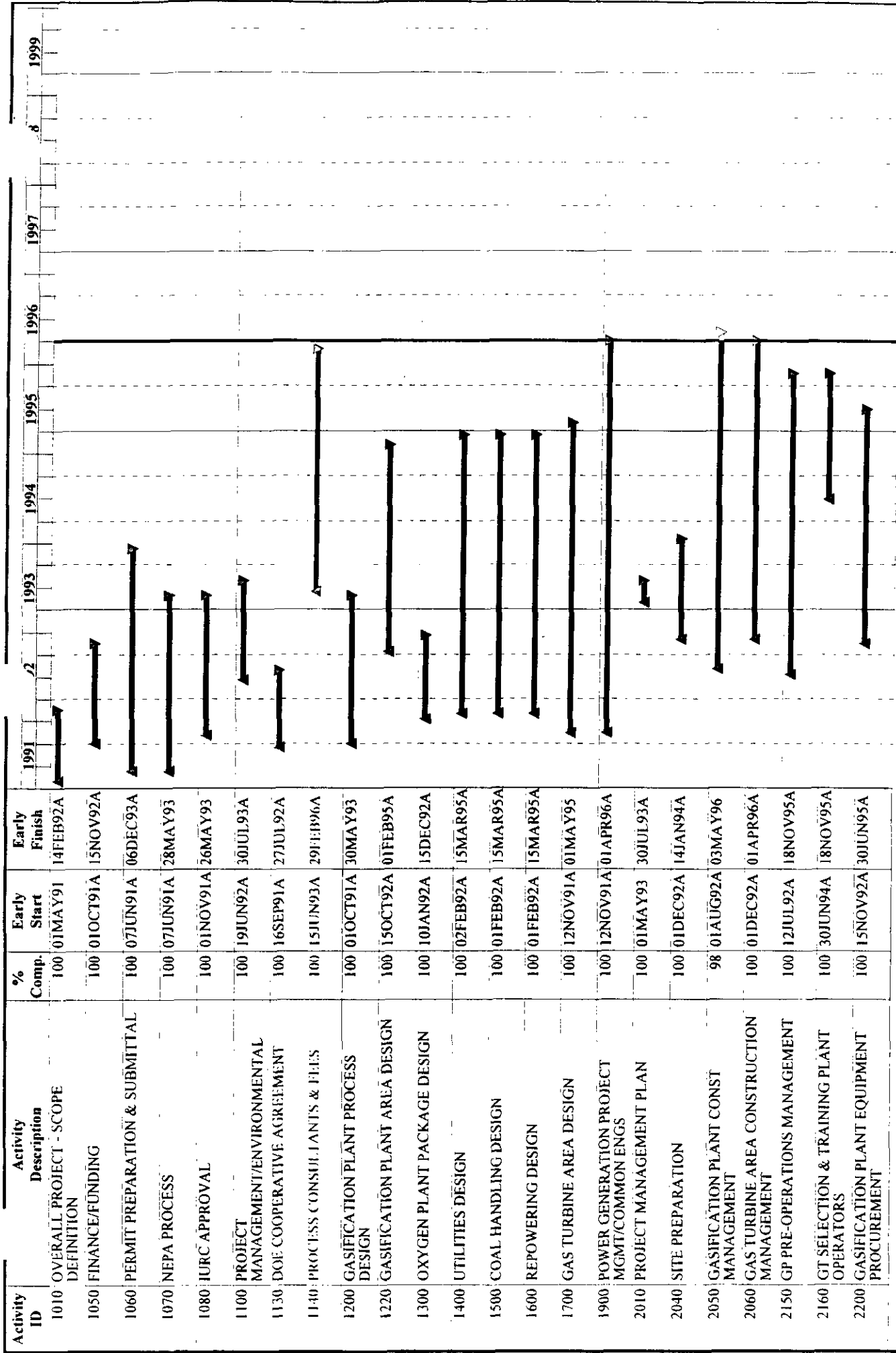


Figure 10

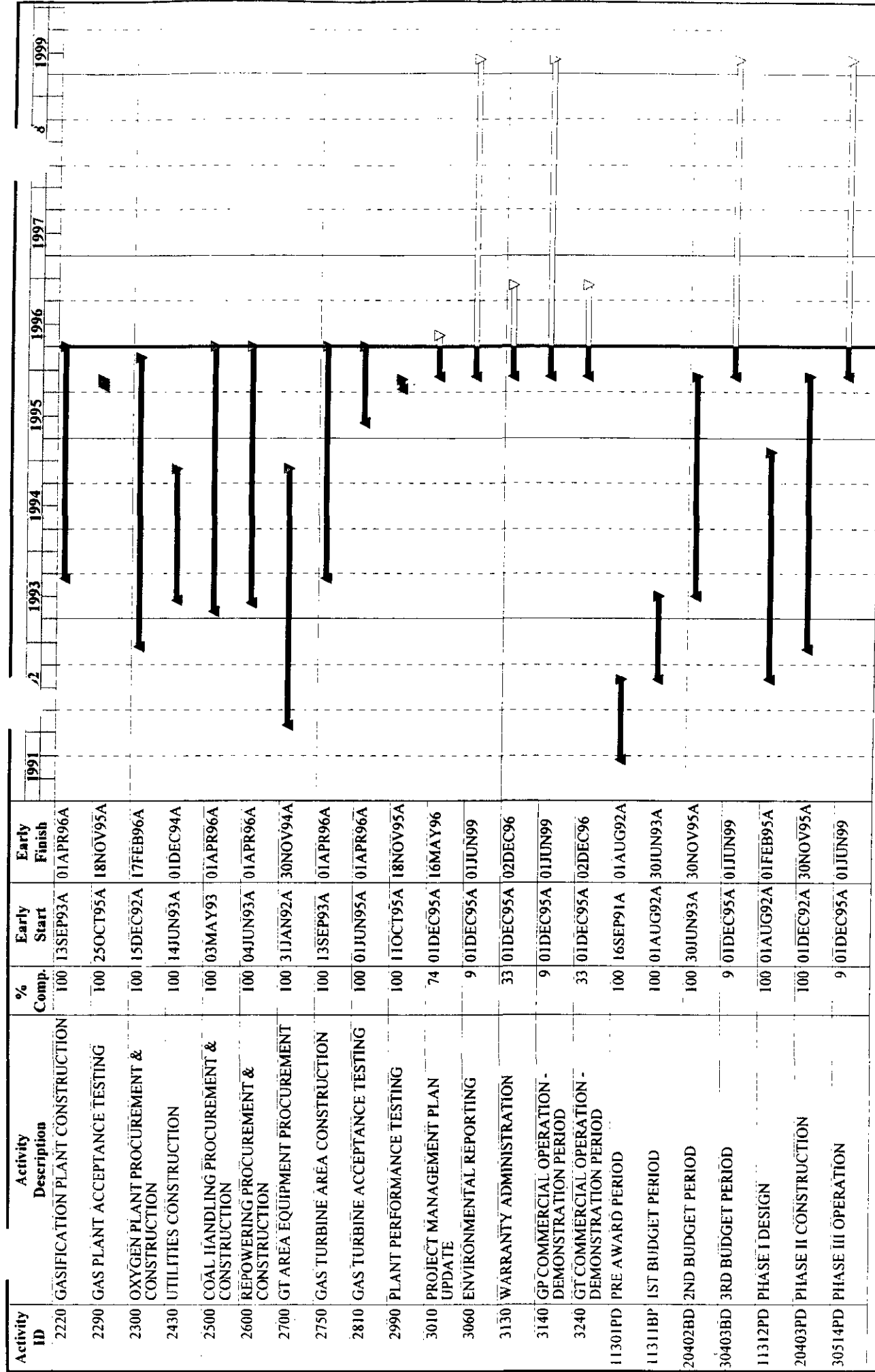


Figure 10

**PLANT OPERATION STATISTICS
DECEMBER 1995**

GASIFICATION PLANT

PERFORMANCE DATA

Cold Gas Efficiency	78.0
Gasifier on Coal (Hours)	84.4
Gasification Plant Capacity Factor (Produced)	4.9
Gasification Plant Capacity Factor (Delivered)	2.6

PRODUCTION DATA

Syngas on Spec (MMBtu)	92,261
1600# Steam (Mlbs)	36,039
Sulfur (Mlbs)	66.9
Slag, Moisture Free (Mlbs)	799.8

DELIVERED PRODUCTION

Actual Syngas Delivered (MMBtu)	49,222
1600# Steam	30,222

MATERIAL/ENERGY USED

Coal, Moisture Free (Tons)	6,533
Coal (MMBtu)	140,251
Intermediate Pressure Steam (Mlbs)	10,508
Electrical Power, Total (MWh)	16,089
Fuel Gas (Mlbs)	3,255

POWER PLANT

Combustion Turbine Generator	6,650 MWH
Steam Turbine Generator	4,627 MWH

Figure 11

Appendix C
LISTING OF TECHNICAL PUBLICATIONS
(PUBLIC INFORMATION)

DATE	TITLE/SOURCE	AUTHOR(S)
April 1995	American Power Conference "Pre-Operation Activities Leading to the Start-up of the Wabash River Repowering Project" - A presentation	Author's and Presenters Stultz - PSI Troxclair - PSI Maurer - PSI
September 1995	Clean Coal Technology Conference "Project Update" - A presentation	Author: Breton - Destec Presenter: Woodruff Destec
November 1995	Project Dedication - Hazel O'Leary (Secretary - Department of Energy) and State and Local dignataries attend site dedication and information program.	
November 1995	Unlisted Conference - London, England "Wabash River Moves into Commercial Operation" - A presentation	Author: Breton - Destec Presenter: Breton
December 1995	Power - Gen Americas '95 "Wabash River Moves into Commercial Operation" - A presentation	Author: Breton - Destec Presenter: Troxclair Destec